Editorial: Living-donor liver transplantation: why the Sun rises in the East and sets in the West?

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Living-donor liver transplantation: why the Sun rises in the East and sets in the West?

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The current section of liver transplantation focuses on hot topics in living-donor liver transplantation (LDLT). LDLT is worldwide practiced, but the highest experience is currently at home in the Eastern hemisphere. The main aim of this section was to highlight important aspects of LDLT including high-end surgical techniques and challenging indications. *Current Opinion in Organ Transplantation* is pleased to present five top reviews from renowned international experts from Eastern and Western centres, including groups from India [1], Turkey [2], South Korea [2], Hong-Kong [3], Canada [4] and Germany [5].

There is no doubt that the success of LDLT is highly depending on the technical performance of the procedure. A comprehensive review from Asan Medical Center in Seoul, South Korea, defined four key elements of technical success of LDLT, namely adequate graft volume, sufficient inflow, good outflow and secure bile duct anastomosis [6]. This definition of technical success is based on the unique experience of one of the worldwide highest-performance centres in LDLT celebrating the extraordinary achievement of 5000 LDLTs in 2018 [7]. Therefore, two reviews of this section have been designated to important technical aspects of biliary [1] and hepatic artery reconstruction [2] in LDLT.

Biliary reconstruction is often considered as Achilles heel of liver transplantation [8]. The current state of high-end range of biliary reconstruction in LDLT has been reported in this section by experts from The Medanta Institute in Delhi, India [1]. The authors highlight the importance of modern magnetic resonance-based biliary imaging modalities in living donors in order to study the individual anatomy of the biliary tree and to be best prepared for donor and recipient surgery. The overall benefit of improved biliary imaging translates in the best possible selection of potential living donors as well as avoidance of biliary complications in donors and recipients. Furthermore, the review focuses on important technical details such as various types of biliary reconstruction and the question whether anastomotic stenting should be performed.

Hepatic artery reconstruction in LDLT is one of the most important technical parts, which needs the highest attention and perfection to avoid potential complications including graft loss. Hepatic artery reconstruction in LDLT is often more demanding and requires a high microsurgical skill set compared with deceased donor liver transplantation (DDLT). The main reason behind these facts is related to the shorter length and much smaller diameters of arterial segments of the partial graft. In this section, the comprehensive joined review of renowned experts from Turkey and South Korea focused on important anatomical and technical details of arterial revascularization in LDLT [2]. The authors defined three important key factors for successful hepatic artery reconstruction such as the selection of recipient artery, the quality and length of the graft artery, and the anastomotic technique. There is an ongoing debate whether arterial reconstruction in LDLT should be performed under the microscope or with loops. Although the review cannot resolve this debate, the authors advocate for using the microscope and highlight the advantages of this important tool.

MELD score and hepatocellular carcinoma (HCC) present the two most important factors, which currently have the greatest impact on listing and organ allocation in DDLT worldwide. Many believe that LDLT should be primarily reserved for candidates with low MELD scores or HCC. Whether patients with high MELD scores (35+) should also have access to LDLT is discussed by expert authors from Hong Kong having a long tradition in LDLT [3]. Various studies on LDLT in high MELD candidates define high MELD by cut-off scores of 25. It is important to emphasize that high MELD should be considered when MELD scores are 35 or greater. The

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authors state that the main argument against LDLT in high-acuity patients relates to the concern that partial grafts might not provide the necessary physiological function to sustain the high demands required in critically ill recipients while simultaneously exposing a healthy donor to risk. The review highlights the importance of timely transplant, the impacts of partial graft and donor morbidity in high MELD (35+) candidates undergoing LDLT. Although the authors give recommendations when LDLT should not be performed in high MELD patients, they clearly support the concept of LDLT in this sick population in high-volume centres with profound experience.

Because the literature of liver transplantation for HCC is rapidly evolving, we have chosen one review exploring the status of LDLT for HCC [5]. This article is authored by leading experts from the University of Toronto, Canada, who are internationally known for their work in this field [9]. The structure of the article follows the discussion of recipient, tumour, donor and ethical factors, which need to be thoroughly considered when LDLT is evaluated in patients with HCC. They speculate on incorporating new technologies, response to treatment and determination of tumour behaviour into HCC criteria for liver transplantation what is just beyond the near horizon. Overall, this article demonstrates the great advantages of LDLT for HCC in the light of continuous organ shortage of deceased donors.

Another hot topic in LDLT extends to the new indication of treating unresectable colorectal liver metastases (CRLMs) by liver transplantation. The main credit of exploring this challenging tumour indication goes to the liver transplant unit from Oslo, Norway [10]. This group introduced a novel procedure combining partial liver transplantation from split grafts with elements of two-stage hepatectomy for unresectable CRLM [11], also named as RAPID concept (Resection And Partial Liver segment 2-3-transplantation with Delayed total hepatectomy). The same concept when applied to LDLT has been first performed by a German transplant group who authored the last article in this section [5]. This technical article is accompanied by nice illustrations presenting the principle of this complex procedure.

Although LDLT was pioneered and initially promoted in the western hemisphere, many Asian LDLT programmes nowadays outperform western centres apart from some exceptions. Although western countries have primarily promoted deceased donor resources to expand the organ pool for liver transplantation, Asian countries have prioritized LDLT as the best approach to cope with cultural, religious and epidemic issue in their countries neglecting the great potential of deceased organ donation (Fig. 1). A comprehensive

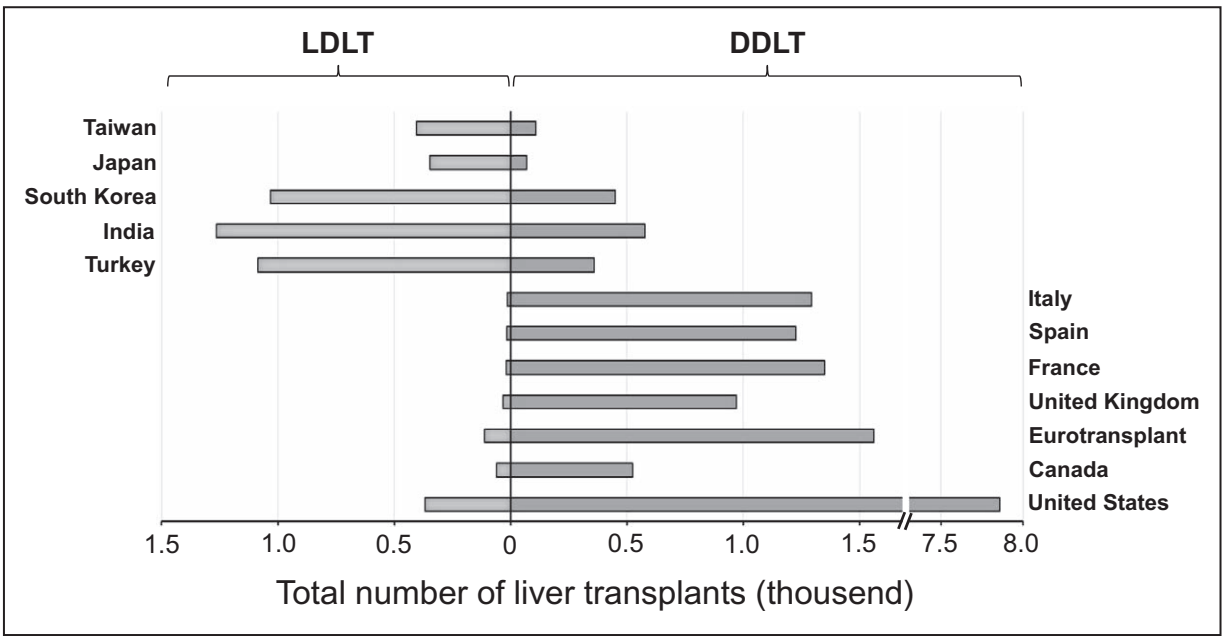

FIGURE 1. Total number of performed living-donor and deceased donor liver transplantations in the year 2017. Numbers are presented for Eastern (left side) and Western countries as well as the Eurotransplant region (right side), which includes Austria, Belgium, Croatia, Germany, Hungary, Luxembourg and Slovenia. Data for Taiwan, South Korea, Turkey, Italy, Spain, France, UK, Canada and the United States were retrieved from the International Registry in Organ Donation and Transplantation (www.irodat.org), data for India and Japan from the Global Observatory on Donation and Transplantation database (www.transplant-observatory.org), and data for the Eurotransplant region from the annual reports of Eurotransplant (www.eurotransplant.org).

perspective article authored by LDLT experts of a high-volume centre in Taiwan highlighted the issues why LDLT became so successful in many Asian countries [12]. The authors concluded that 'LDLT flourishes in Asia as a response to what is dictated as the norm in Asia societies regarding religion, culture, tradition and politics, as well as the severe organ shortage in a population with the highest demand for liver transplantation due to its endemicity with HBV and HCV-related disease and high incidence of HCC' [12]. However, we have to keep in mind that the primary mission of both LDLT and DDLT is to save lives and prevent dropout as well as death on the waiting list. Under this perspective, the East needs to further develop deceased donation, while the West requires reviving living donation, just for the simple reason of saving lives (Fig. 1). As long as organ shortage will remain, LDLT offers a great treatment for many indications especially when time plays an important role to have access to a life-saving organ. Therefore, many will agree that the sun of LDLT will remain to rise in the East but should continue to shine in the West in the near future.

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Conflicts of interest

There are no conflicts of interest.

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